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【Title of the Invention】 TELEPHONE SET

5 **【Abstract】**

【Object】 To automatically change a holding tone or a ringer tone depending on seasons, time, etc.

【Construction】 Disclosed is a telephone set including a melody circuit 21 and a clock circuit 44. The melody circuit 21 contains data of plural musical pieces
10 selectable by an external signal. When a call is held or a call arrives, one of the data of the plural musical pieces, which corresponds to the time clocked by the clock circuit 44, is selected and taken out as an audio signal. A holding tone or an incoming call ringer tone is obtained from the taken-out audio signal.

【Claims】

15 **【Claim 1】** A telephone set comprising: a melody circuit containing data of plural musical pieces selectable by an external signal; and a clock circuit, wherein one of the data of the plural musical pieces, which corresponds to time clocked by the clock circuit, is selected and taken out as an audio signal when a call is held or a call arrives, and a holding tone or an incoming call ringer tone is
20 obtained from the taken-out audio signal.

【Claim 2】 The telephone set as claimed in claim 1, wherein the time is a month and day.

【Claim 3】 The telephone set as claimed in claim 1, wherein the time is an hour and minute.

25 **【Detailed Description of the Invention】**

【0001】

【Industrial Applicability】 The present invention relates to a telephone set.

【0002】

【Prior Art】 In a telephone set having a call holding function, the signal of a
5 holding tone is output to the line on hold so as to tell the caller that the line is on
hold. Further, melodies (musical pieces) and various sound effects are used as
the holding tone.

【0003】 In addition, there is a telephone set in which a melody or a sound
effect rings as an incoming call ringer tone.

10 **【0004】**

【Problem to Be Solved by the Invention】 However, most telephone set
models have only one type of holding tone. Although there is a telephone set
model in which plural holding tones are prepared, a holding tone to be output
must be selected by a user. Further, since the selection of a holding tone is not
15 conducted so frequently that the user remembers such an operation, the user
needs to consult an operation manual when changing a holding tone, which is
troublesome.

【0005】 As a result, there are many cases where a user actually uses the
factory tone as a holding tone. In many cases, even if a user selects a holding
20 tone when buying a telephone set, the selected holding tone is subsequently kept
intact. That is, plural holding tones are often ineffectively used even when they
are prepared in a telephone set.

【0006】 On account of this, a holding tone is always the same, and thus there
occurs a case where a hearer is displeased with the same music sound whenever
25 he/she is on hold.

【0007】 Further, the above-mentioned situation is the same as for a ringer tone.

For example, it is rare to effectively use plural ringer tones even if they are prepared, which also causes the same problem as in the case of a holding tone.

【0008】 Accordingly, the present invention has been made to solve the above-
5 mentioned problem occurring the prior art.

【0009】

【Means for Solving the Problem】 Assuming that reference numerals of
respective parts correspond to those in an embodiment to be described below,
there is provided a telephone set comprising a melody circuit 21 containing data
10 of plural musical pieces selectable by an external signal; and a clock circuit 44,
wherein one of the data of the plural musical pieces, which corresponds to time
clocked by the clock circuit 44, is selected and taken out as an audio signal when
a call is held or a call arrives, and a holding tone or an incoming call ringer tone
is obtained from the taken-out audio signal.

15 【0010】

【Function】 If time changes according to the time clocked by the clock circuit
44, a holding tone or a ringer tone is automatically changed.

【0011】

【Embodiment】 In FIG.1, reference numeral “10” designates a telephone set,
20 and reference numeral “99” designates a telephone line. In the telephone set 10,
reference numeral “11” designates a transmitter, reference numeral “12”
designates a receiver, reference numeral “13” designates a transmitting amplifier,
reference numeral “15” designates a receiving amplifier, and reference numeral
“16” designates a line interface circuit. Here, the line interface circuit 16
25 includes a 4-2 wire conversion circuit, a switch circuit for opening/recovering the

line 99, a detection circuit for detecting incoming call ringer signals, etc.

【0012】 Further, reference numeral “21” designates a melody circuit for generating an audio signal to be used as a holding tone or a ringer tone, reference numeral “22” designates a ringer amplifier, reference numeral “23” designates a speaker for outputting the ringer tone. Here, the melody circuit 21 is a circuit in which a ROM 211 for recording digital audio data to be played back as a holding tone or a ringer tone, a D/A converter 212 for converting digital audio data read out from the ROM 211 into an analog audio signal, and a control circuit 213 for controlling the read-out of digital data from the ROM 211 are integrated into one IC chip.

【0013】 The digital audio data recorded in the ROM 211 amounts to, for example, six musical pieces. FIG 2 illustrates an example of contents of the six musical pieces. When the six musical pieces have piece numbers $N = 0$ to 5, respectively, the musical piece corresponding to each piece number is as follows:

15

$N = 0$: musical piece suitable to season from winter to early spring

$N = 1$: musical piece suitable to graduation season

$N = 2$: musical piece suitable to season from spring to early summer

$N = 3$: musical piece which one can frequently hear in summer

20

$N = 4$: musical piece suitable to autumn season

$N = 5$: Christmas song

【0014】 If the melody circuit 21 is instructed to read out a musical piece whose piece number is specified as N , an address signal for the musical piece in the ROM 211, which has piece number N , is generated by the control circuit 213, and simultaneously a read-out clock is provided to the ROM 211. Then, N th digital audio data recorded in an address area corresponding to the address signal is read out from that address area according to its order, and the read-out N th

digital audio data is supplied to the D/A converter 212.

【0015】 In this way, if the melody circuit 21 is instructed to read out a musical piece whose piece number is specified as N, the analog audio signal of the Nth musical piece can be obtained from the melody circuit 21.

5 【0016】 Reference numeral “30” designates a microcomputer for system control, which includes a CPU 31, a ROM 32 for recording various programs, a RAM 33 for a work area and for retaining data, an input port 34, and an output port 35.

【0017】 In this embodiment, as a part of the programs recorded in the ROM
10 32, a processing routine, for example, a processing routine 100 as illustrated in FIGS. 3 and 4, is installed in the ROM 32. Further, a table MLDTBL, which represents piece number N and a month MNTH corresponding thereto, as illustrated in FIG. 2, is installed in the ROM 32.

【0018】 Given signals are accessed between the CPU 31 and circuits 13, 15,
15 16, 21, 22 through ports 34, 35.

【0019】 A switch 43 for detecting on-hook/off-hook of various operation keys 42, such as dial keys 41, a holding key and so forth, and a transmitter/receiver 11, 12 is connected to the microcomputer 30, and simultaneously a clock circuit (real-time clock) 44 is connected to the microcomputer 30. This clock circuit
20 44 is formed by one IC chip, and clocks the current time, that is, a date (year/month/day) and a time (hour/minute/second). The clocked output of the clock circuit 44 is supplied to the microcomputer 30.

【0020】 As the CPU 31 executes processing of the routine 100, the telephone set 10 operates as follows:

25 【0021】 [Call Waiting] If the telephone set is powered on, the CPU 31 starts processing of the routine 100 in step 101, and each unit of the telephone set 10 is

initialized in step 102. As a part of such initialization, muting of the amplifiers 13, 15, 22 is turned on, and simultaneously the line interface circuit 16 is placed into an off-hook status.

5 **【0022】** Subsequently, in step 103, the CPU 31 determines if there is an incoming call ringer signal. When a ringer signal is not obtained, that is, when no call arrives, the processing proceeds from step 103 to step 104. In step 104, the CPU 31 checks the on/off state of the switch 43, thereby determining if the transmitter/receiver 11, 12 is off-hook. When the transmitter/receiver 11, 12 is not off-hook, the processing proceeds from step 104 to step 105.

10 **【0023】** In step 015, the CPU 31 checks if, among the keys 42, a registration key 42R for setting or registering an operation mode, etc. is pressed. When the registration key 42R is not pressed, the processing returns from step 105 to step 103. Thus, during call waiting, the waiting state is implemented while steps 103 to 105 are repeated.

15 **【0024】** [Call Arrival] If a call arrives during the waiting state, the call arrival is detected in step 103, and the processing proceeds from step 103 to step 111. In step 111, muting of the amplifier 22 is turned off.

【0025】 Subsequently, in step 112, the month of a date clocked by the clock circuit 44 is used as a value MNTH of the table MLDTBL, and is converted into
20 piece number N corresponding to the month (value MNTH) by making reference to the table MLDTBL. For example, if the month of a date clocked by the clock circuit 44 is December, a value MNTH is set to MNTH = 12, and is converted into N = 5 corresponding to MNTH = 12 by making reference to the table MLDTBL. Further, piece number N is specified for the melody circuit 21, and
25 simultaneously the melody circuit 21 is instructed to read out a musical piece corresponding to the specified piece number.

【0026】 Thus, an analog audio signal of the Nth musical piece is output from

the melody circuit 21. For example, if a piece number is $N = 5$ in FIG. 2, an analog audio signal of the Christmas song is output.

【0027】 Since an analog audio signal from the melody circuit 21 is supplied to the speaker 23 through the amplifier 22, a musical piece according to the analog
5 audio signal is output from the speaker 23, that is, a musical piece of piece number N is output as a ringer tone.

【0028】 In this way, ringing according to call arrival is conducted by a musical piece of piece number N , that is, a ringer tone suitable to a season.

【0029】 In addition, the processing by the CPU 31 proceeds from step 112 to
10 step 113, in which the CPU 21 determines if a ringer signal informing of call arrival has been detected. When a ringer signal has been obtained, the processing proceeds from step 113 to step 114. In step 114, the CPU 31 checks the on/off state of the switch 43, thereby determining if the transmitter/receiver 11, 12 is off-hook. When the transmitter/receiver 11, 12 is not off-hook, the
15 processing returns from step 114 to step 113.

【0030】 Therefore, when an incoming call request from the caller continues, and simultaneously the transmitter/receiver 11, 12 is on-hook, steps 113 and 114 are being repeated, and simultaneously a musical piece according to step 112 is being output as a ringer tone from the speaker 23.

20 【0031】 If the transmitter/receiver 11, 12 is off-hook in order to answer an incoming call, this is detected in step 114, and the processing proceeds to step 115. In step 115, muting of the amplifier 22 is turned on, and simultaneously the melody circuit 21 is placed into the halt mode. Thus, a ringer tone stops.

【0032】 Further, in step 116, muting of the amplifiers 13, 15 is turned off, and
25 the interface circuit 16 is placed into the line recovery state.

【0033】 Thus, subsequently, it is possible to talk with the caller, who gives the

incoming call, in a manner to be described below.

【0034】 When the caller's telephone set is on-hook during the repetition of steps 113 and 114, a ringer signal from the line 99 is not obtained. This is detected in step 113, and the processing returns from step 113 to step 103, so that
5 the telephone set 10 is brought into the waiting state again.

【0035】 [Telephone Conversation] During a telephone conversation, the called party's voice is sent to the line 99 via a signal line of transmitter 11 → amplifier 13 → adder circuit 14 → interface circuit 16. A voice signal from the caller is supplied to the receiver 12 via a signal line of line 99 → interface circuit
10 16 → amplifier 15.

【0036】 Thus, it becomes possible to conduct a telephone conversation with the caller by using the transmitter 11 and the receiver 12.

【0037】 The processing by the CPU 31 proceeds to step 121 during the telephone conversation, and the CPU 31 checks in step 121 if a holding key 42H
15 among the operation keys 42 is pressed. When the holding key 42H is not pressed, the processing proceeds from step 121 to step 122. In step 122, the CPU 31 checks the on/off state of the switch 43, thereby determining if the transmitter/receiver 11, 12 is on-hook. When the transmitter/receiver 11, 12 is not on-hook, the processing returns from step 122 to step 121.

20 【0038】 In this way, the holding key 42H and on-hook are checked through steps 121 and 122 during a telephone conversation.

【0039】 [Holding] If the holding key 42H is pressed during a telephone conversation, this is detected in step 121, and the processing proceeds from step 121 to step 123, in which muting of the amplifiers 13, 15 is turned on. In step
25 124, similar to in step 112, the month of a date clocked by the clock circuit 44 is used as a value MNTH of the table MLDTBL, and is converted into piece

number N corresponding to the month (value MNTH) by making reference to the table MLDTBL. Further, piece number N is specified for the melody circuit 21, and simultaneously the melody circuit 21 is instructed to read out a musical piece corresponding to the specified piece number.

5 **【0040】** Thus, an analog audio signal of the Nth musical piece is output from the melody circuit 21.

【0041】 Further, the analog audio signal from the melody circuit 21 is sent to the line 99 via the adder circuit 14 and the interface circuit 16. Consequently, the caller hears a holding tone according to the analog audio signal, that is, a
10 musical piece of piece number N, for example, a Christmas song.

【0042】 On this occasion, the analog audio signal from the melody circuit 21 is supplied to the receiver 12 via a stage behind the muting stage of the amplifier 15, and thus the holding tone is also output from the receiver 12.

【0043】 In this way, a musical piece of piece number N, that is, a musical
15 piece suitable to a season, is output as a holding tone.

【0044】 Meanwhile, the processing by the CPU 31 proceeds to step 125, and step 125 is repeated until the holding key 42H is pressed again in step 125, which corresponds to the waiting state for holding cancellation instructions.

【0045】 If the holding key 42H is pressed, the processing proceeds from step
20 125 to step 126. The melody circuit 21 is placed into the halt mode in step 126, muting of the amplifiers 13, 15 is turned off in step 127, and then the processing returns to step 121.

【0044】 Thus, holding is canceled, and talking with the caller giving the incoming call becomes possible again.

25 **【0047】** [Call Ending] If the transmitter/receiver 11, 12 is on-hook during a

telephone conversation, this is detected in step 122, and the processing proceeds from step 122 to step 131. In step 131, call ending procedures are executed, that is, muting of the amplifiers 13, 15 is turned on, the interface circuit 16 is placed into the line open state, and so forth. Thereafter, the processing returns
5 to step 103, and thus the telephone set 10 is brought into the waiting state again.

【0048】 [Call Origination] If the transmitter/receiver 11, 12 is on-hook during the waiting mode, this is detected in step 104, and the processing proceeds from step 104 to step 141. In step 141, call origination procedures are executed, that is, muting of the amplifiers 13, 15 is turned off, the interface circuit 16 is
10 placed into the line recovery state, and so forth. Subsequently, if the phone number of a counterparty is input through the dial keys 41, the dial signal is sent from the interface circuit 16 to the line 99, and the telephone set of the counterparty is called.

【0049】 Meanwhile, the processing proceeds from step 141 to step 121, and
15 then a telephone conversation with the counterparty can be conducted if the counterparty answers the originating call.

【0050】 [Settings] If the registration key 42R among the operation keys 42 is pressed during the waiting state, this is detected in step 105, and the processing proceeds from step 105 to step 151. In step 151, corresponding settings or
20 registrations are executed according to keys pressed after the registration key 42R is pressed.

【0051】 For example, if the registration key 42R is pressed and then key “4” of the dial keys 41 is pressed, the clock circuit 44 is placed into the time setting mode. In such a state, if the dial keys are pressed in order of “0” → “1” → “0”
25 → “1” → “1” → “4” → “0” → “0”, the clock circuit 44 is set to “14:00 January 01”.

【0052】 If step 151 is ended, the processing returns to step 103, and the

telephone set 10 is brought into the waiting state again.

【0053】 [Others] As described above, a holding tone or a ringer tone can be changed according to the time of day. It is also possible to change only one of the holding and ringer tones according to time (a month and day or an hour and 5 minute), without changing the other. Further, when a specific setting operation is executed, a musical piece of piece number N may be fixedly set as the holding or ringer tone regardless of time.

【0054】 In addition, piece number N may be randomly specified so that a hearer cannot know which musical piece sounds. If a user specifies time or a 10 musical piece, for example, specifies a birthday and a musical piece, the specified musical piece can be output on the birthday.

【0055】

【Effect of the Invention】 According to the present invention, since a holding tone or a ringer tone varies according to a season or the time of day, a user does 15 not need the annoyance of consulting an operation manual. Further, a hearer almost never feels unpleasant when a call is held or a call arrives. On the contrary, pleasure, interest, surprise, seasonal feeling and the like can be given to a user.

【0056】 Since most telephone sets have been already equipped with the clock 20 circuit 44 and others for implementing the above-mentioned function, such a function can be easily implemented, and a rise in cost can also be prevented.

【Brief Description of the Drawings】

【FIG. 1】 is a systematic view illustrating an example of the present invention.

【FIG. 2】 is a view illustrating an example of a data table.

25 【FIG. 3】 is a flowchart illustrating a part of an example of the present invention.

【FIG. 4】 is a flowchart illustrating an example following FIG. 3.

【Reference Numerals】

10: telephone set	11: transmitter	12: receiver
16: line interface circuit	21: melody circuit	23: speaker
5 30: microcomputer	44: clock circuit	99: telephone line
100: processing routine	MLDTBL: data table	

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